

Stress analysis of femoral hip with bone resorption

Abstract

Bone is a living tissue. It continuously reproduces its structure and its growth depends partly upon the applied mechanical load. After the implant is inserted, the load equilibrium is disturbed, bone resorption and the stress shielding phenomena may occur. Aseptic loosening is the main contributor for hip prosthesis failure. The purpose of the study was to determine the effect of bone resorption on the stress values and hence obtain a better understanding of the behavior of the stress adaptive boneremodeling. The bone material used for the analysis was assumed to be isotropic and linearly elastic, and the external loads applied comprised of a femoral head load and an abductor load. A Finite element computer program for evaluating the changes in bone's density and modulus was developed. The values of stress for bone, cement mantle in medial, and lateral positions of Total Hip Replacement (THR) are presented. The failure mechanisms of THR with bone resorption observed the implant loosening since stress is reduced.

Keyword: Aseptic loosening; Failure mechanism; Finite element computer program; Implant loosening; Lateral positions; Prosthesis failure; Stress shielding; Total hip replacement (THR)